

**Work Order ID 66923**

Wednesday, March 02, 2011 2:59:59 PM

Page 1

Item ID: D350-748-101

Accept

Revision ID:

Item Name: Crosstube Installation, High Fwd

Start Date: 3/2/2011 Start Qty: 1.00

Required Date: 3/23/2011 Req'd Qty: 1.00

Reference:

Cust Item ID:

Customer:

Approvals:

Process Plan:

Date: 11-03-2

Tooling:

Date:

QC:

Date:

SPC (Y/N):

Date:

Run Start

Stop

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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Draw Nbr	Revision Nbr
D350-748-141	F

100



DC

Document Control

DOCUMENT CONTROL

0.00

Memo

0.00

Photocopy bluefile &amp; type labels per PPPD350-748-101

CHG002

110



CNC Bend 1

CNC Delta 100 Bender

BENDING MACHINE - CROSSTUBES

0.00

Memo

0.00

Bend tube as per Dwg D350-748-141 using CNC bender program D350F and Folio FT

120



QC

Quality Control

QC15- Crosstube Dimensional Check

0.00

Memo

0.00

11 / 10 / 12 ①  
for MLJ 11-10-12

11-9-28

11.09.28

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
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**NOTE:** Date & initial all entries

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QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Run Start



Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
125		0.00							
	HandFXtube								
Hand Finishing Crosstubes	<p>Memo</p> <p>***Stress relief***</p> <p>Heat treat crosstube as per QSI010 4.3</p> <p>Temp: <u>375°</u></p> <p>Start time: <u>7h00</u></p> <p>Finish time: <u>11h00</u></p>	0.00						①	SAD 11-09-27
127	QC6- Inspect dimensions to drawing	0.00							
	QC								
Quality Control	Memo	0.00							8/11/29

**Dart Aerospace Ltd**

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Stop

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130		0.00							
	Crosstubes								
Crosstubes									
Crosstubes									
	Memo	0.00							
	1-Drill Tube as per Dwg D350-748-141 Using DT8876 A,B & C Drill Jigs, Set-up drill table as per QSF010								
	2-Deburr								
	3-Engrave Part # and Batch # as per Dwg D350-748-141								
	4-Remove all marks from tube within limits of D350-748-141								
	5- Apply a light coat of LPS3 on the interior of tube Batch: <u>M109956</u>								
140	QC5- Inspect part completeness to step on W/O	0.00							
									
QC									
Quality Control									

Memo

0.00

CHECK 10 DEG HOLES WITH DT8876E (EUROCOPTER CLAMP)

1 ILW  
SAD

11-09-29

SAD 11-09-30

ILW

SAD

11-09-30

Juler/30

**Dart Aerospace Ltd**

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150

Outsource process-Cadplate per QSI017 4.1.9.1

0.00



Outsource3

Memo

0.00

Outsource process - Cad plate

Issue P/O: 15070  
Stress relief at 375° for 5 hours  
Magnetic Particle Inspect per ASTM E1444  
Cadium Plate per AMS-QQ-P-416B, Class 1, Type 2  
Embrittle relief at 375° for 8 hours, Chromate Treat  
Possibe Supplier: Southwest United Industries  
Ensure Certificate of Conformity is attached

11-09-30

160

Receive &amp; Inspect for Damage &amp; Mat'l Certs

0.00



Packaging

Memo

0.00

Packaging

Ensure certificate of conformity is attached

11-10-07

161 &amp; 162

170

QC5- Inspect part completeness to step on W/O

0.00



QC

Memo

0.00

Quality Control

Juliola

\*SEE W/D CHG ATTACHED

Dart Aerospace Ltd

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DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

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			Initial Chief Eng	Action Description Chief Eng	Sign & Date			
11.10.11	160	CAD plate color scraped off in several locations from handling	GP 11.10.11 PS/042	Acceptable. Underlying metal not scratched	GP 11.10.11	S 11.10.12	GP 11.10.11 PS/042	S 11.10.12

NOTE: Date & initial all entries



W/O: 66923		WORK ORDER CHANGES						
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector	
11.10.07	161	LOAD TUBE TO 3500 <sup>1/2</sup> FOR 1 MINUTE PER D.S. EMAIL	CP	11.10.07	1	CP 11.10.07 PS/672	11/10/12	
11.10.07	162	NDT tube PO 15121 BA 11-10-11	W M	11-10-11	1	CP 11.10.07 PS/672	11/10/12	

Part No: D350-748-101 PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

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NOTE: Date & initial all entries

## Chris Provencal

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**From:** David Shepherd <dshepherd@dartaero.com>  
**Sent:** Tuesday, April 27, 2010 3:40 PM  
**To:** 'Mike Petsche'  
**Cc:** 'Bill Beckett'; 'L Lacelle'; 'Chris Provencal'; 'Dan Stow'; ssheldon@dartaero.com  
**Subject:** 350 crosstubes

Mike,

I discussed the 350 crosstube load testing with Bill a little while ago and this plan makes sense to him.

So, my recommendation to clear these crosstubes is to load the fwd crosstubes to 3500 lb and the aft crosstubes to 3000 lb in the deflection test rig and document on the work orders that this test has been completed. Hold max load for 1 minute. Per TP-D350-748-2, these loads represent the maximum load on these crosstubes at gross weight and are below the yield point of the material. I would like to request that Chris Provencal witness these tests and sign off the work orders based on his experience with Dart landing gears. My feeling is that if there is a problem with the parts, it will manifest itself during this load test. I, for one, would feel a lot more confident in testing each crosstube in this manner than relying totally on what Exova has to say. I think it would be very difficult to reach a conclusion on the whole batch on the basis of cracks in two parts from the batch.

I believe that we can accomplish this before next Friday, which also gives us time to hear what Exova has to say in case it has an impact on our decision. So far, what I have seen from Exova shows me that there are fluctuations in the heat treating but the tubes are heat treated to our specification.

For this reason, I believe we should tell DHS that it looks like we will be able to start shipping 350 crosstubes by May 7th pending a successful Engineering test of the material.

David.

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Run Start



Stop



Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
180  SprayPaint Spray Painting	SprayPaint  Memo 1-Prime inside crosstube as per QSI 005 4.2 2-Prime Outside of Tube as per Dart QSI 005 4.2	0.00  0.00				<u>W</u>	<u>11</u>	<u>10</u>	<u>11</u> (1)
190  QC Quality Control	QC14- Inspect Spray Paint  Memo Then, Wrap in plastic bag to protect from scratches	0.00  0.00				<u>2</u>	<u>11</u>	<u>10</u>	<u>12</u> (0)
200  Crosstubes Crosstubes	Crosstubes  Memo 1-Install Ground wire Insert, then insert screw and washer 2-Install Abraison strips as per Dwg D350-748-141 & QSI 035. 3-Install supports Using Dt8876 as per Dwg D350-748-141, Torque to 60-80 IN-LBS	0.00  0.00				<u>W</u>	<u>11</u>	<u>10</u>	<u>12</u> (0)

**Dart Aerospace Ltd**

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QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Run Start

Stop

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
--------------------------------	--------------------------	----------------------	---------	--------	--------------	---------------	---------------	------------------	----------------

210

QC5- Inspect part completeness to step on W/O

0.00



QC

Memo

0.00

Quality Control

220

Pick Kit

0.00



Packaging

Memo

0.00

Packaging

230

QC4- 100% Inspect kits for completeness

0.00



QC

Memo

0.00

Quality Control

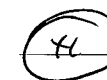


Setup Start

Stop

Cust Item ID:

Customer:



11/10/12

11/10/12 (1)

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

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**Work Order ID 66923**

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Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Run Start

QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
240		0.00							
	Packaging								
Packaging	Memo	0.00							
Packaging	Identify and pack for shipping as per PPP D350-748-101								
	Location: _____								
	PPP Rev: _____								
250		0.00							
	QC21- Final Inspection - Work Order Release								
QC	Memo	0.00							
Quality Control									

11/10/12  
mt  
11-10-12

**Dart Aerospace Ltd**

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Page 1

**Parent Item Name:** Crosstube Installation, High Fwd

**Required Date:** 3/23/2011

**Required Qty: 1.00**

**Comments:** IPP Rev:A New Issue 06-07-05 JLM  
 IPP Rev:B Update qty of MS21042L5 06-09-12 KJ  
 IPP Rev:C Rev B 07-11-15 DD  
 IPP Rev D Combined manufacturing 08.04.02 EC verified by: DD  
 IPP Rev:E 08-06-24 revD as per dwg DD verified by:EC IPP Rev:F  
 10.08.04 added QSI010 4.3 DD verf:EC

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D350-748-141TRN		Manufactured	No			110	Each	0.0000	1	1			
						B72816				SAD 1709-27			
Crosstube Turning Detail													
ALS4-1032-225		Purchased	No			200	Each	3,839.000	1	1			
										11/10/12			
Insert													
						B# 118696							
					<u>Location</u>	<u>Loc Qty</u>		<u>Loc Code</u>					
					PK011	3839							
					110768	3839							
AN960JD10	NAS1149D0363J	Purchased	No			200	Each	24.0000	1	1			
										11/10/12			
Washer					<u>Location</u>	<u>Loc Qty</u>		<u>Loc Code</u>					
					ST	6							
					107715	6							
					ST335	18							
					105792	2							
					112279	16							

**Dart Aerospace Ltd**

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Start Date: 3/2/2011

Required Date: 3/23/2011

Start Qty: 1.00

Required Qty: 1.00

D2856-400 Manufactured No

200 f

158.4380 1.181 1.243158



Abraison Strip

B# 71164

Location

Loc Qty

Loc Code

ST403

158.4380421

56626

0.00004211

59920

43.381

63735

115.057

D3502-1 Manufactured No

200 Each

32.0000 2 2



Support

Location

Loc Qty

Loc Code

ST063

32

52903

1

61206

12

61843

9

64004

10

MS21920-20 Purchased No

200 Each

61.0000 2 2



Clamp (per MIL-DTL-8783C)

B# 118236

Location

Loc Qty

Loc Code

LG

61

112624

2

114687

1

115736

8

116799

50

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Shop Packet Print

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**Dart Aerospace Ltd**

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Start Qty: 1.00

Required Qty: 1.00

MS27039-1-10

Purchased

No

200

Each

84.0000

1

1



Screw



*MA 11/10/12*

## Location

## Loc Qty

## Loc Code

ST291

84

112794

3

115935

81

220

Each

200.0000

8

8

AN4-41A

Purchased

No



Bolt



## Location

## Loc Qty

## Loc Code

ST360

200

115108

100

115705

50

116191

50

220

Each

1,674.000

16

16

AN4-6A

Purchased

No



Bolt



*M118422 11/10/12*

## Location

## Loc Qty

## Loc Code

ST356

1674

112933

96

113149

17

115108

8

115457

253

115936

200

116191

300

116400

400

116924

400

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Shop Packet Print

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AN5-32A

Purchased

No

220

Each

149.0000

4

4

Bolt

## Location

## Loc Qty

## Loc Code

ST340

149

115016

38

115108

50

115589

60

115698

1

AN960JD416

NAS1149D0463J

Purchased

No

220

Each

30.0000

32

32

Washer

## Location

## Loc Qty

## Loc Code

ST300

24

113288

24

ST356

6

115622

6

AN960JD516

NAS1149D0563J

Purchased

No

220

Each

34.0000

8

8

Washer

## Location

## Loc Qty

## Loc Code

ST

34

103694

18

107534

12

109287

4

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries



# Picklist Print

Wednesday, March 02, 2011 3:00:07 PM

Work Order ID: 66923

Parent Item: D350-748-101

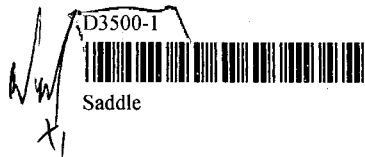
Parent Item Name: Crosstube Installation, High Fwd

Start Date: 3/2/2011

Required Date: 3/23/2011

Start Qty: 1.00

Required Qty: 1.00



Manufactured No

220 Each

37.0000



4 4  
Handwritten signature

Location

Loc Qty

Loc Code

ST243

20

62207

20

ST424

2

55605

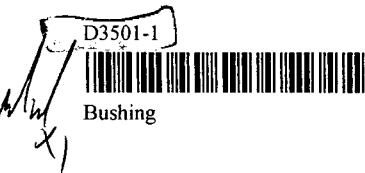
2

ST425

15

61838

15



Manufactured No

220 Each

202.0000



16 16  
B67757  
Handwritten signature

Location

Loc Qty

Loc Code

ST063

202

45402

15

45918

112

48268

3

53779

5

61984

67



Purchased No

220 Each

4,871.000



24 24  
M118451 11/10/12  
Handwritten signature

Location

Loc Qty

Loc Code

ST300

4871

1123143

2

115589

10

115621

20

116188

2839

116823

2000

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

# Picklist Print

Wednesday, March 02, 2011 3:00:08 PM

Page 6

Work Order ID: 66923

Parent Item: D350-748-101

Parent Item Name: Crosstube Installation, High Fwd

Start Date: 3/2/2011

Required Date: 3/23/2011

Start Qty: 1.00

Required Qty: 1.00

MS21042L5

Purchased

No

220

Each

998.0000

4

4

Nut

## Location

## Loc Qty

## Loc Code

ST139

26

114813

26

ST300

972

115594

276

116105

496

116548

200



M117441

\$

11/10/12

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES						
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector	

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

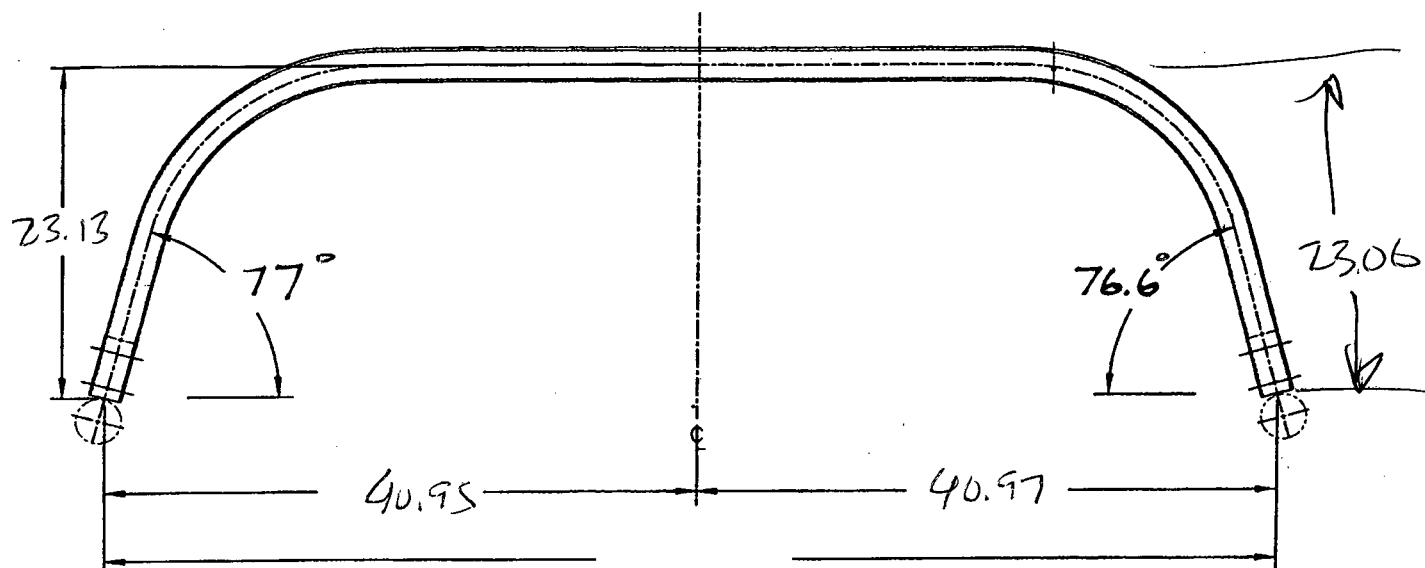
Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

DART AEROSPACE LTD		Work Order:	00923
Description: Crosstube High Fwd (AS350/355)		Part Number:	D350-748-101
Inspection Dwg: D350-748-141 Rev: E		Page 1 of 1	

Required Dimension	Min	Max
Height	23.13	23.37
1/2 Span	40.78	41.02
Angle	75	77
Total Span	81.56	82.04



Comments
Crushing $(2.057 - 2.305) = 5.7\%$
$(2.051 - 2.313) = 6.0\%$
Twist = 0.195"
Bent low one side, <del>off</del> , Acceptable. CP 11.09.28 Q81042

QC15 Inspection	
Date	11.09.28

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	10.08.23	Dwg Rev updated	KJ	11.09.23

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES						
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector	

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

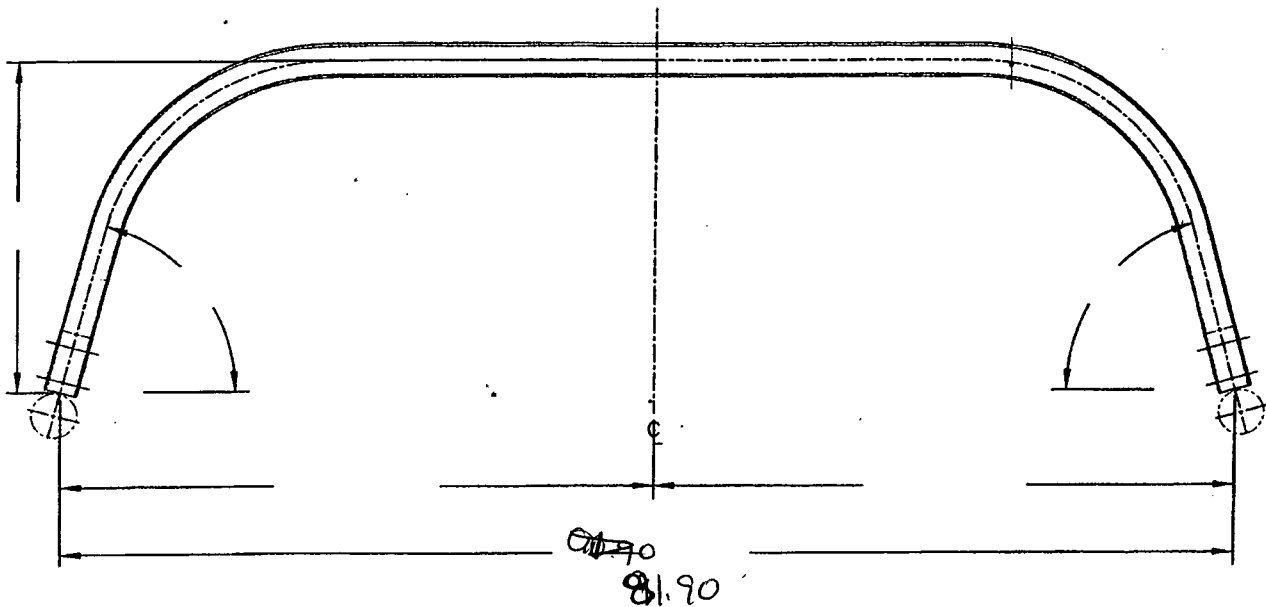
NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

DART AEROSPACE LTD		Work Order:	66823
Description: Crosstube High Fwd (AS350/355)		Part Number:	D350-748-101
Inspection Dwg: D350-748-141 Rev: E		Page 1 of 1	

Stress Relief why

Required Dimension	Min	Max
Height	23.13	23.37
1/2 Span	40.78	41.02
Angle	75	77
Total Span	81.56	82.04



Comments
twist = 0.193

QC15 Inspection	8
Date	10/01/29

Rev	Date	Change	Revised by	Approved
A	07.02.06	New Issue	KJ/JM	
B	10.08.23	Dwg Rev updated	KJ	

1008-23





Item	Qty -141	Part Number	Description
1	X	D350-748-141	CROSSTUBE ASSEMBLY (AS 350/355 HI FWD)
2	1	D6015-125	CROSSTUBE (OR D6017-115)
3	2	D3502-1	SUPPORT
4	2	D2856-400-710	ABRASION STRIP
5	1	AELS-1032-225	INSERT
6	1	NAS1149D0363J	WASHER (OR AN960JD10)
7	2	MS21920-20	CLAMP (PER DART SPEC. M-MS21920-20)
8	1	MS27039-1-10	SCREW

#### GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6015-125 OR D6017-115  
FINISHED LENGTH = 110.270±0.06
- 2) FINISH: MAGNETIC PARTICLE INSPECT PER DART QSI 038 4.2  
CADMIUM PLATE PER AMS-QQ-P-416B, CLASS 1, TYPE II  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
PAINT OUTSIDE PER DART QSI 005 4.2
- 3) TOLERANCES ARE PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- 6) IDENTIFICATION: DART PART NUMBER "D350-748-141" AND BATCH NUMBER ON INSIDE OF CUFF  
PER DART QSI 044 6.4 (VIBRATING STYLUS)
- 7) WEIGHT: 30.45 lbs
- 8) PART IS SYMMETRIC ABOUT CENTERLINE, EXCEPT FOR Ø0.297 HOLE.
- 9) BLEND OUT ALL EDGES FROM MACHINING LONGITUDINALLY, TRANSITION SHOULD BE SMOOTH.  
NOTE: ALL HOLES ARE DRILLED AFTER BENDING.
- 10) BEND PROGRESSIVELY WITH A MINIMUM OF 7 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 6% BASED ON O.D.
- 11) HEAT TREAT TO MIN. 180 KSI PER MIL-T-6736 OR AMS 2759-1C AFTER TURNING. ACCEPTABLE TO VERIFY TENSILE STRENGTH BY HARDNESS TEST PER ASTM E18 TO 40-45 HRC.
- 12) INSTALL D2856-400-710 ABRASION STRIPS WITH A GAP ON BOTTOM SIDE OF CROSSTUBE, CENTERED OPPOSITE D3502-1 SUPPORT, PER QSI 035.
- 13) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. WHEN DRILLING HOLES EXTREME CARE MUST BE TAKEN AND CAREFUL DEBURRING PERFORMED TO ENSURE A CLEAN HOLE WITH NO CRACKING/CHIPPING/GROOVES.
- 14) TORQUE CLAMPS 60 TO 80 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING.
- 15) MAX TWIST AFTER BENDING: WITH XTUBE LAYED FLAT ON SURFACE, THE DIFFERENCE BETWEEN CUFF HEIGHTS FROM THE SURFACE MAY BE NO LARGER THAN 0.25 (ZN C1-3).

SHOP COPY  
RETURN TO  
ENGINEERING  
UNCONTROLLED COPY  
SUBJECT TO AMENDMENT  
WITHOUT NOTICE  
WORK ORDER  
NO. 64293  
*11-03-2*

RELEASED  
2011-01-18

F	ADD HRC TEST OPTION (B8-1) PER PAR 08-040, ADD TWIST LIMIT (A8-1, C1-3), ADD D6015-125 OPTION (C8-1), STOCK DIM NOW MACHINED (D1-4)	CP	10.11.23
E	REVISE GENERAL NOTES; UPDATE TO CURRENT ADD STANDARDS; RELOCATED FLAG #6 PER PAR 08-046 (ZN A6-3); TOLERANCES (ZN C6-3, D1-3)	RF	09.09.30
D	MAG. PARTICLE AND CAD PLATE AS MFD.	CP	06.10.31
C	ADD CAD PLATING	CP	06.08.14
B	ADD D6017-115 & PRIME AND PAINT	CP	06.06.30
A	NEW ISSUE	CP	06.03.31
REV.	DESCRIPTION	BY	DATE
DESIGN	<i>JP</i>	<b>DART AEROSPACE LTD</b> HAWKESBURY, ONTARIO, CANADA	
DRAWN	<i>JP</i>		
CHECKED	<i>JP</i>	DRAWING NO.	REV. F
MFG. APPR.	<i>JP</i>	D350-748-141	SHEET 1 OF 4
APPROVED	<i>JP</i>	TITLE	SCALE
DE APPR.	<i>JP</i>	CROSSTUBE (AS 350/355 HI FWD)	NTS
DATE	10.11.23	<small>COPYRIGHT © 2006 BY DART AEROSPACE LTD  THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.</small>	

**Dart Aerospace Ltd**

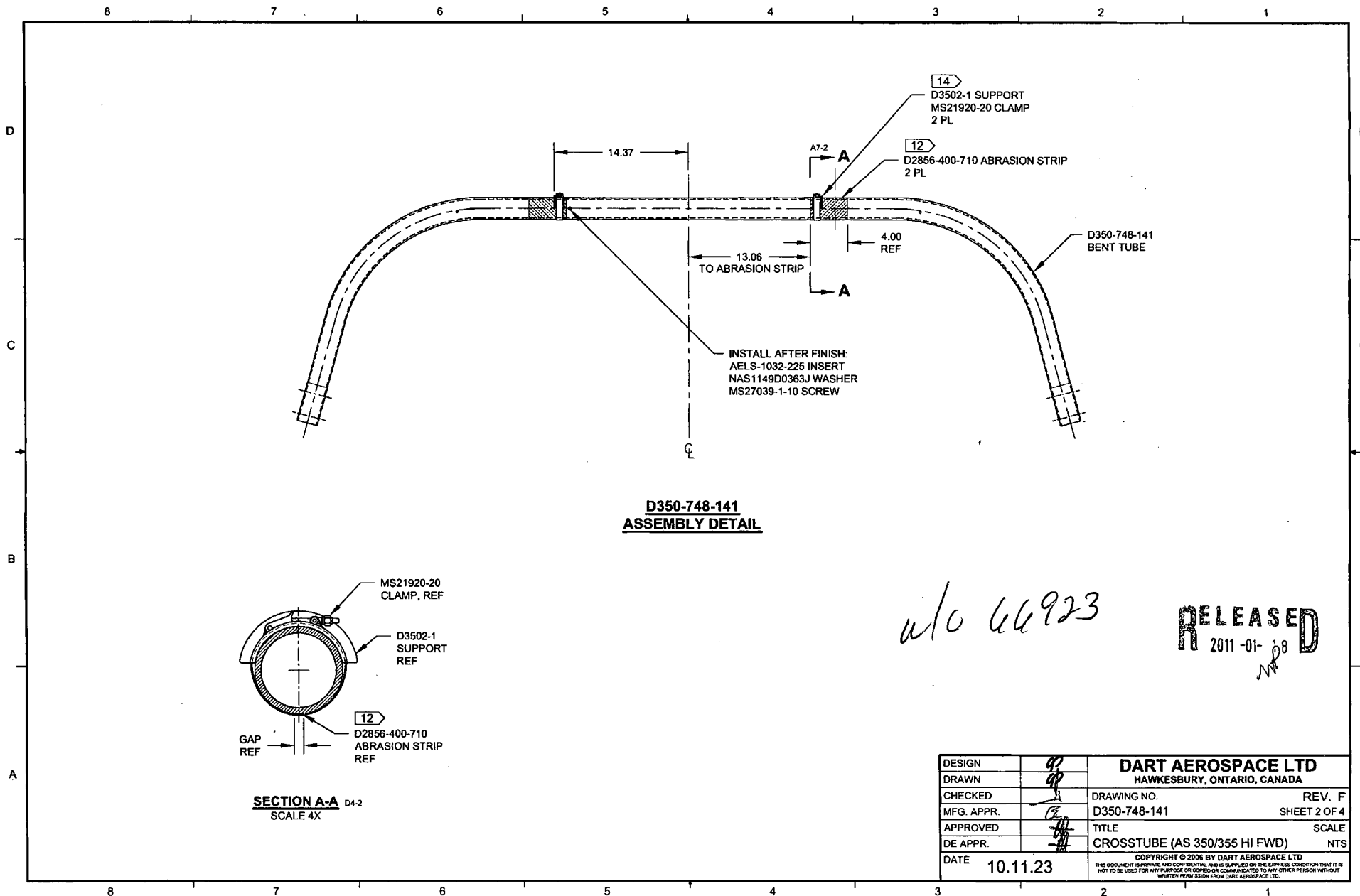
W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries



**Dart Aerospace Ltd**

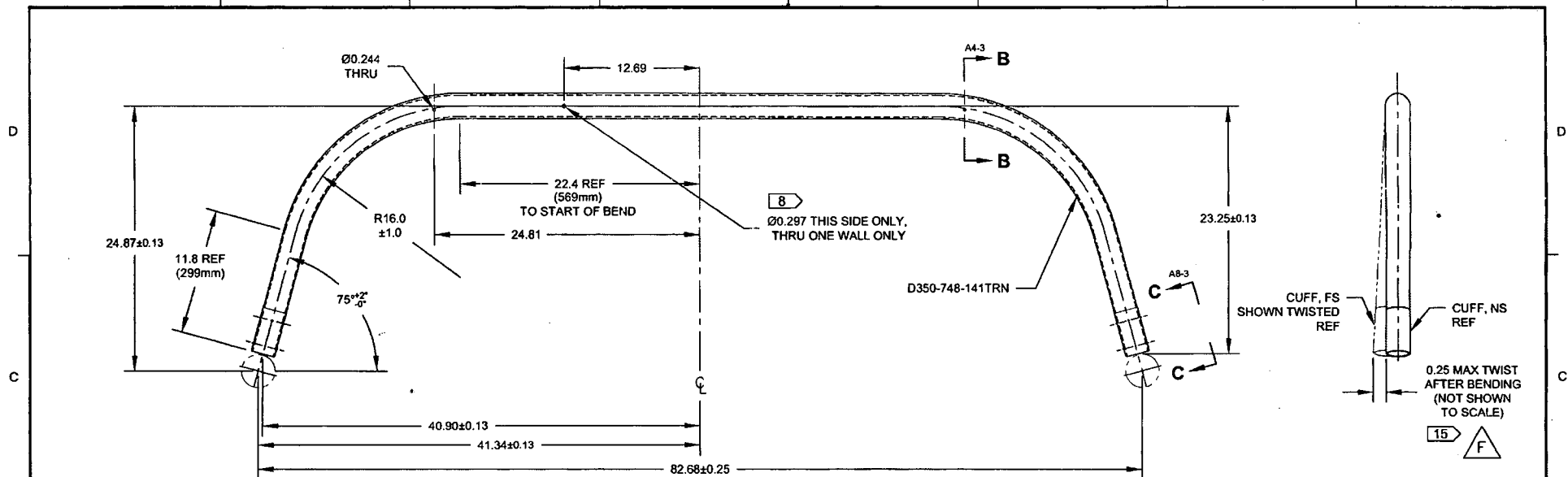
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DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_  
 Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

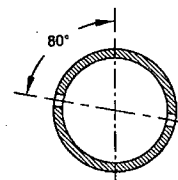
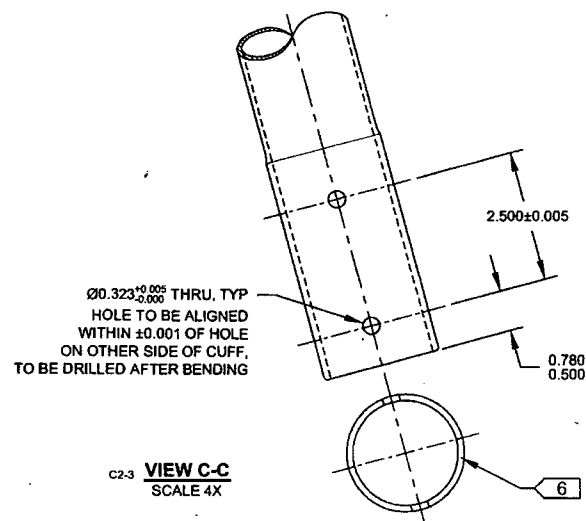
**NOTE:** Date & initial all entries

8 7 6 5 4 3 2 1



**D350-748-141**  
**BENDING AND DRILLING DETAIL** 10

u1066923



**SECTION B-B** D3-3  
SCALE 4X

RELEASED  
2011-01-18

DESIGN	92	<b>DART AEROSPACE LTD</b>	
DRAWN	92	HAWKESBURY, ONTARIO, CANADA	
CHECKED	1	DRAWING NO.	REV. F
MFG. APPR.	2	D350-748-141	SHEET 3 OF 4
APPROVED	3	TITLE	SCALE
DE APPR.	4	CROSSTUBE (AS 350/355 HI FWD)	NTS
DATE	10.11.23	COPYRIGHT © 2006 BY DART AEROSPACE LTD	
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8 7 6 5 4 3 2 1

**Dart Aerospace Ltd**

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

NCR:		WORK ORDER NON-CONFORMANCE (NCR)						
DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

**NOTE:** Date & initial all entries

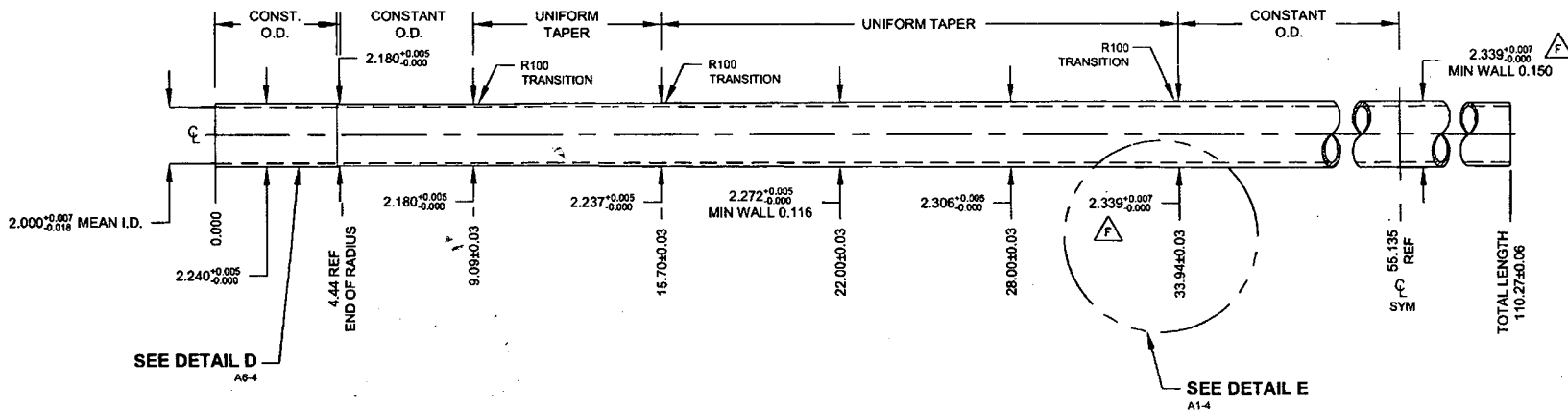
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D

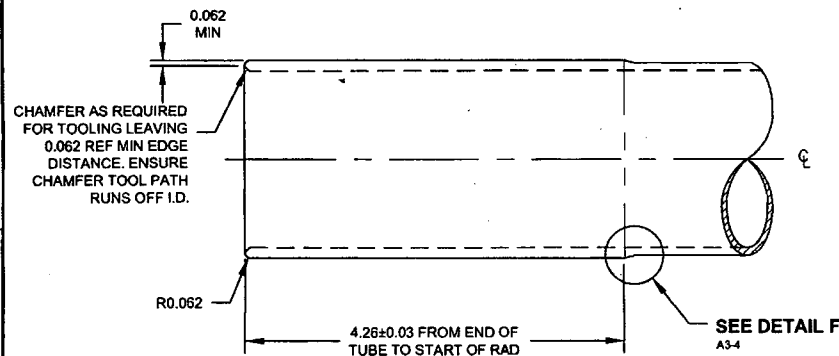
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B

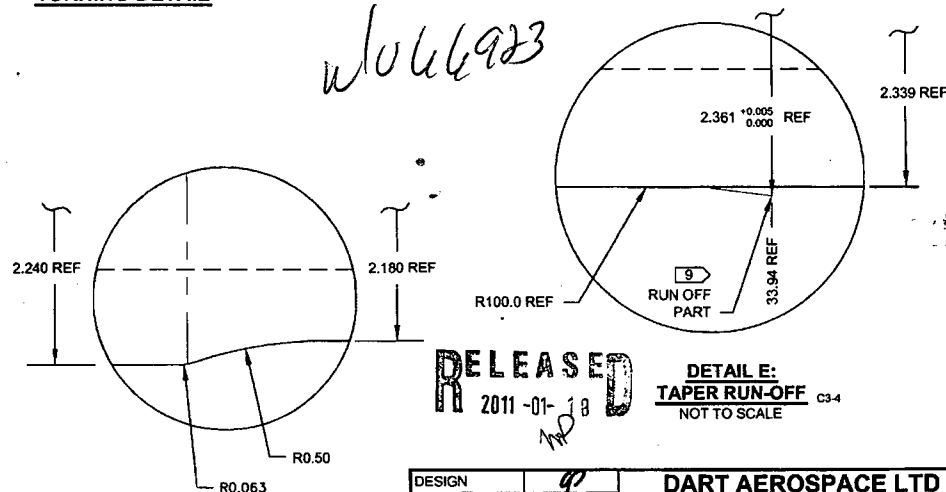
A



**D350-748-141TRN  
TURNING DETAIL**



**DETAIL D:  
CROSSTUBE CUFF** C7-4  
SCALE 3X



**DETAIL F:  
CUFF TRANSITION** A5-4  
NOT TO SCALE

**RELEASED**  
2011-01-18

**DETAIL E:  
TAPER RUN-OFF** C3-4  
NOT TO SCALE

DESIGN		<b>DART AEROSPACE LTD</b>
DRAWN		HAWKESBURY, ONTARIO, CANADA
CHECKED		DRAWING NO. REV. F
MFG. APPR.		D350-748-141 SHEET 4 OF 4
APPROVED		TITLE SCALE
DE APPR.		CROSSTUBE (AS 350/355 HI FWD) NTS
DATE	10.11.23	

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Dart Aerospace Ltd

W/O:		WORK ORDER CHANGES					
DATE	STEP	PROCEDURE CHANGE	By	Date	Qty	Approval Chief Eng / Prod Mgr	Approval QC Inspector

Part No: \_\_\_\_\_ PAR #: \_\_\_\_\_ Fault Category: \_\_\_\_\_ NCR: Yes No DQA: \_\_\_\_\_ Date: \_\_\_\_\_

Resolution: \_\_\_\_\_ Disposition: \_\_\_\_\_ QA: N/C Closed: \_\_\_\_\_ Date: \_\_\_\_\_

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DATE	STEP	Description of NC Section A	Corrective Action Section B			Verification Section C	Approval Chief Eng	Approval QC Inspector
			Initial Chief Eng	Action Description Chief Eng	Sign & Date			

NOTE: Date & initial all entries



CERTIFICATE OF  
CONFORMANCE

CADORATH PLATING CO. LTD.  
2150 LOGAN AVENUE  
WINNIPEG, MANITOBA R2J-0J1

DATE: Oct-05-2011

CONSIGNEE TO: Dart Aerospace Ltd.  
1270 Aberdeen St.  
Hawksbury, ON K6A 1K7

W/O #: 108221

INVOICE #: 57013

CONTRACT OR  
PURCHASE ORDER #

PO15070

DESCRIPTION: SKID

QTY 1

P/N # d350-748-101

S/N # B66923

STRESS RELIEF BAKE @ 375 DEG. FOR 5 HRS. MPI IAW ASTM-E-1444. CADMIUM PLATED IAW AMS-QQ-P-416C, TYPE 2 YELLOW, CLASS 1. HYDROGEN EMBRITTLEMENT BAKE @ 375 DEG. FOR 8 HRS. BAKE HEAT CHARTS #11-1036 & #11-1040.

*Sulidog*

CERTIFICATE: I certify that the items indicated here on have been inspected and tested and conform to all specifications and requirements detailed on the contract or purchase order.

Approved Inspector:



*[Handwritten signature]*

## 5.0 PARTS LIST

Qty -101	Qty -201	Part Number	Description
X		D350-748-101	CROSSTUBE INSTALLATION, AS 350/355 HIGH FWD /
	X	D350-748-201	CROSSTUBE INSTALLATION, AS 350/355 HIGH AFT
1		D350-748-141	CROSSTUBE ASSEMBLY, AS 350/355 HIGH FWD
	1	D350-748-241	CROSSTUBE ASSEMBLY, AS 350/355 HIGH AFT
*2	*2	D3502-1	SUPPORT
*2	*2	D2856-400-710	ABRASION STRIP
*1	*1	AELS-1032-225	INSERT
*2	*2	MS21920-20	CLAMP
*1	*1	MS27039-1-10	SCREW
*1	*1	AN960JD10	WASHER
4	4	D3500-1	SADDLE
16	16	D3501-1	BUSHING
16	16	AN4-6A	BOLT
8	8	AN4-41A	BOLT
4	4	AN5-32A	BOLT
32	32	AN960JD416	WASHER
8	8	AN960JD516	WASHER
24	24	MS21042L4	NUT (OR MS21042-4)
4	4	MS21042L5	NUT (OR MS21042-5)

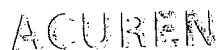
\* REFERENCE ONLY. PARTS ARE INCLUDED IN D350-748-141/241 ASSEMBLIES ABOVE

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Revision: B

Date: 07.06.15



1-003427

Client : DART AEROSPACE  
 Contact : LINDA  
 Lieu de travail : 1270, ABERDEEN ST, HAWKSBURY, ONT. K6A1K7  
 Description : FPI ON X-TUBES  
 # Rapport : P-12676

# Travail : \_\_\_\_\_ Date : 2016-07  
 Jour : Dim Lun Mar Mer Jeu Ven Sam  
 # P.O. : 30 551 W.O. # : 188-11-02 376  
 # Véhicule : \_\_\_\_\_ Caméra # \_\_\_\_\_

[illegible]

Consumables : \_\_\_\_\_

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Équipement : \_\_\_\_\_

Représentant Client : X

Eric Dunning 11/09/07

V/C	VÉRIFICATION CAMÉRA
V/E	VÉRIFICATION ÉQUIPEMENT SÉCURITÉ
V/D	VÉRIFICATION AVEC DÉTECTEUR DE RADIATION
B/I	BARRIÈRE & PANNEAUX INSTALLÉS
C/V	CAMÉRA VERROUILLÉE & ENTREPOSÉE SÉCURITAIREMENT
C/S	CAMÉRA SONDÉE APRÈS CHAQUE UTILISATION

pieces was not received

<i>Jonquière</i>	(418) 542-8273 • Téléc.: (418) 542-5494	<i>Saint John</i>	(506) 847-0194 • Téléc.: (506) 847-0194
<i>Val-d'Or</i>	(819) 354-9030 • Téléc.: (819) 825-9564	<i>Oakville</i>	(905) 825-8595 • Téléc.: (905) 825-8598
<i>Gaspé</i>	(418) 392-3618 • Téléc.: (418) 392-4114	<i>Sudbury</i>	(705) 522-1849 • Téléc.: (705) 522-9926
<i>Montréal</i>	(514) 207-9226	<i>Cambridge</i>	(519) 622-3112 • Téléc.: (519) 622-1326
<i>Ottawa</i>	(819) 360-0685 • Téléc.: (819) 827-3513	<i>Cornwall</i>	(613) 931-1261 • Téléc.: (613) 931-2777
<i>Sherbrooke</i>	(819) 620-5456 • Téléc.: (819) 346-6828	<i>Sarnia</i>	(519) 336-3021 • Téléc.: (519) 336-8220
<i>Halifax</i>	(902) 497-3870 • Téléc.: (902) 445-5090	<i>Thunder Bay</i>	(807) 475-4240 • Téléc.: (807) 577-2017

ACUREN



P. 12176

PAGE 1 DE 1

CLIENT	DART AEROSPACE	DATE	2011-10-07	HEURE	<input type="checkbox"/> AM <input checked="" type="checkbox"/> PM
ATTENTION	LINDA	N° TRAVAIL	188-11-02370		
ADRESSE	1270 ABERDEEN ST HAWKESBURY, ont. K6A 1K7	N° CLIENT PO/VO	30551		
PROJET	30551	SITE DE TRAVAIL	SHOP		
ITEM(S) EXAMINÉ	CROSSFUBE D 350-748-101 ; <del>72997</del> ID 66923 ; 72999 ; 72997 ; 72998	ACCEPTATION STD.	ASTM E1417-09 (NO CRACK)	DATE/RÉV.	09

DESCRIPTION DES TRAVAUX	N° PROCÉDURE	LT- <del>ACT</del> XP101	DATE/RÉV.	24/0	N° TECHNIQUE	LT-xx3x-xxx	DATE/RÉV.
N° ITEMS	MATÉRIEL		ÉPAISSEUR				
DESCRIPTION	FPI ON 4 X-TIMER 100% OF EXTERNAL SURFACE						

MÉTHODE :	<input checked="" type="checkbox"/> FLUORESCENT	<input type="checkbox"/> VISIBLE	<input checked="" type="checkbox"/> LAVABLE À L'EAU	<input type="checkbox"/> MÉTHODE DISSOLVANT	<input type="checkbox"/> PRÉ-ÉMULSIONNANT
MARQUE :	MAGNAFLUX	BARB: 10C072	LUM. NOIRE S/N 26529	IPDiss. > 1 000 µ W/cm²	EAmbiant < 2 fc
PÉNÉTRANT :	Zygo 2L67	TEMPS PÉNÉTRATION MIN. 10	MIN.	ÉQUIP. LUMIÈRE	<input checked="" type="checkbox"/> LAMP. POCHE <input type="checkbox"/> LAMP. CULASSE <input checked="" type="checkbox"/> PUISS. > 100 fc @ SURFACE
DISSOLVANT PÉNÉTRANT	TEMPS SÉCHAGE MIN. > 10	MIN.	AUTRES		
RÉVÉLATEUR	TEMPS RÉVÉLATION MIN. 10	MIN.	MÈTRE LUM. N/S	DATE CAL DUE	
TYPE RÉVÉLATEUR	<input type="checkbox"/> NON AQUEUX <input type="checkbox"/> AQUEUX <input type="checkbox"/> SEC				

## SURFACE INSPECTÉE

CONDITION SURFACE	<input type="checkbox"/> MEULÉE	<input type="checkbox"/> SOUDÉE	<input checked="" type="checkbox"/> MACHINÉE	<input type="checkbox"/> MRENAILLÉE	<input type="checkbox"/> MÉTAL PROPRE
TEMPÉRATURE SURFACE	<input type="checkbox"/> < - 4°C/20°F	<input checked="" type="checkbox"/> 4°C/20°F À 10° C/50°F		<input type="checkbox"/> 10°C/50°F À 52°C/125°F	<input type="checkbox"/> > 52°C/125°F

## RÉSULTATS ☐ MÉTRIQUE ☐ IMPÉRIALE

ITEM	COMMENTAIRES	ACCEPTÉ	REJETÉ
1	ID 72 998	✓	
2	ID 72 999		✓
3	ID 72 997		✓
4	ID 66 923	✓	

(CRACKS TRANSVERSE TO THE TUBE ON 2 SIDES)  
(CRACKS TRANSVERSE TO THE TUBE ON 1 SIDE)



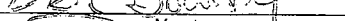
### Étendue des Services

L'entente selon laquelle le Groupe Acuren Inc. exécute les services ne concerne que les énoncés par écrit. En aucune circonstance ces services ne s'étendent au-delà de l'exécution des services demandés. Il est entendu que toutes les descriptions, les observations et les expressions d'opinions faites par Acuren reflètent les opinions ou les observations de l'entreprise fondées sur l'information et les hypothèses fournies par le propriétaire/opérateur, et elles ne constituent pas des déclarations ou des garanties ou ne peuvent être interprétées comme constituant. Le Groupe Acuren Inc. n'assume aucune des responsabilités du propriétaire/opérateur, et le propriétaire/opérateur conserve la responsabilité entière des décisions prises en matière d'ingénierie, de fabrication, de réparation et d'usage à partir de l'information ou des données fournies par Acuren en rapport avec les services décrits dans les présentes ne peuvent excéder le coût des services rendus.

### Norme de Diligence

Dans l'exécution des services, le Groupe Acuren Inc. Applique le degré de diligence, le soin et la compétence normalement exercés dans des circonstances semblables par d'autres fournisseurs de ce type de services opérant dans la même localité ou dans une localité similaire. Aucune autre garantie, implicite ou explicite, n'est faite ou voulue par le Groupe Acuren Inc.

## SIGNATURES

REPRÉSENTANT	 MOULÉ		 SIGNATURE		FTJ#:
TECHNICIEN (SIGNATURE):	 MOULÉ				RAPPORT
NOM (MOULÉ):	DAVID PEPIN 1 <sup>er</sup> TECHNICIEN				RÉVISÉ PAR:
			2 <sup>nd</sup> TECHNICIEN		NOM
	ONGC NIVEAU 2 SNT NIVEAU 2		ONGC NIVEAU SNT NIVEAU		INITIALES
	ONGC N° REGISTRATION 11611		ONGC N° REGISTRATION		

BLANCHE - COPIE DU CLIENT    JAUNE - COPIE DU BUREAU    ROSE - COPIE DU TECHNICIEN    OR - COPIE DU BUREAU

LFD-H3044

PT Décembre 2005